alternate to using the artificial load has been to monitor the carbon or unburned fuel content of the crankcase oil and when a threshold value is reached the oil is changed. This approach is premised on the concept that carbon or raw fuel on the cylinder walls and in the ring grooves can be washed down by the lubricating oil, but once the oil carbon or fuel content becomes high, the oil itself provides the mechanism whereby carbon is transported to the piston-cylinder clearance. Another method for dealing with wetstacking is to use a fuel additive that will encourage complete combustion. While some benefit was noted in this study, fuel additives are not compatible with single fuel strategies.--

a1

On pages 6-7, delete the last paragraph on page 6, continued on page 7, and insert the following:

--The present invention solves the wetstacking problem by raising the reaction temperature by (primarily) restricting the flow of intake air and (secondarily), if desired, elevating the temperature of the intake air, combined with "smart" control of those operations. In comparison to the case where there are no intervention measures, a given quantity of fuel releases a given amount of energy to the gas charge. If the initial temperature of the air is higher, then the final temperature of the gas after combustion will be higher. Or, if the amount of excess air in the charge is reduced, then the final temperature will be again higher. Consequently, both of these methods raise combustion temperature and either can be used as an intervention technique. For intake air heating, a heat exchanger with the engine exhaust is adequate. However, heat exchangers are somewhat expensive, comparatively large, and the exhaust side can foul, due to accumulation of soot on heat transfer surfaces. Intake air throttling can be done with a simple throttle valve that requires minimum space, is inexpensive, is reliable, and can be fully opened to return the engine to full power capability. Accordingly, the invention preferably restricts air intake according to a control mechanism, which is, if desired,

a2

a2 supplemented by raising the temperature of intake air via water jacket heat exchange.--

On page 7, delete the first and second paragraphs and insert the following:

--The present invention is of an apparatus and method for reducing or eliminating wetstacking in internal combustion engine systems operating substantially under capacity, comprising: establishing an exhaust temperature minimum set point; monitoring exhaust temperature of an engine; and restricting air intake into the engine when the exhaust temperature is below the set point. In one embodiment, intake air is heated when the exhaust temperature is below the set point, with the intake air divided into first and second paths, the first path being blocked and the second path being heated, and preferably wherein the second path comprises a fixed flow choke. Or in a second embodiment, a proportional controller may be employed to regulate amount of restriction. Air intake into the engine may be restricted via a <u>proportionally controlled</u> valve upstream of the intake manifold of the engine. The valve is preferably a butterfly valve or a valve that does not eliminate air intake even when fully closed.

a3

The invention is also of an apparatus and method for reducing or eliminating wetstacking in internal combustion engine systems operating substantially under capacity, comprising: monitoring an operational parameter of an engine; and based on the parameter, restricting air intake into the engine via a valve upstream of the air intake manifold of the engine. In one embodiment, monitoring comprises monitoring exhaust temperature of the engine and the restriction is employed when the temperature is below a set point. In another embodiment, which may in combination with the temperature-based restriction, intake air is heated when the restriction is operating.--

On page 8, delete the Figure 1 description on line 11 and insert the following:

--Fig. 1 is a schematic diagram of the fixed-geometry restriction embodiment of the

a4 invention; and--

On page 8, delete the last paragraph and insert the following:

--The following discussion of preferred embodiments is directed to diesel electric generators, but the invention is suited to use with all diesel engines. In a diesel electric generator, as the intake air temperature is raised, the exhaust temperature approaches the intake air temperature asymptotically. It is preferable to employ the invention to maintain an exhaust temperature of 300 C or above when the motor is unloaded/underloaded.--

a5

On page 10, delete the second full paragraph and insert the following:

--Both intake air restriction and intake air heating are capable of elevating the exhaust temperature of an unloaded engine sufficiently to match the 50% load case. Intake can be heated by each of three methods: electric heating, which can draw power from the underloaded generator, exhaust gas heat exchange, or cooling water jacket heat exchange. If electric heat is to be used, heating elements must not be fragile and vulnerable to engine vibration. Note that the artificial load on the engine will contribute to extra wear and extra fuel consumption. Exhaust gas heat exchange alone can adequately elevate the intake air temperature so that no additional intervention is necessary to achieve an exhaust temperature of 300 C. However, this heat exchanger is subject to degradation and fouling by accumulation of carbon on the exhaust gas side. Furthermore, heat exchangers can be large and somewhat expensive, particularly gas to gas. Heat exchange with engine cooling water has the advantage of liquid to gas heat exchange, which is somewhat easier than gas to gas and hence, is cheaper and more compact. Although this method has the advantage of maximum temperature control by thermostat, this heat source alone will not be sufficient to elevate intake air temperature to the criterion of 300 C exhaust temperature.--

a6

On page 11, delete the first full paragraph and insert the following:

--Each of the intervention methods discussed, i.e., intake air heating, or intake air restriction, can be used singly or in combination. In other words, if the engine cooling water is passed through a heat exchanger, the intake air would be heated to a temperature only slightly below the thermostat setting, around 85 C. Then, air restriction to provide an intake manifold vacuum of 125 mm Hg should be sufficient to result in the exhaust temperature meeting the criterion of 300 C for a particular engine.--

a7

On page 12, delete the first full paragraph and insert the following:

--The embodiment **50** of Fig. 2 preferably employs a smart or proportional controller **34** that will actuate a valve **52** to provide for a variable amount of intake air restriction based on input from an exhaust temperature measurement. A heat exchanger **56** can also be used with this air intake in order to provide part of the relief. However, if sufficient restriction can be provided, then this implementation is preferred i.e., without heat exchange. The exhaust temperature responds very quickly to load (less than one second) and such controller requires perhaps another second to reset the valve position to provide the appropriate level of intake air restriction. The gain on the controller can be set so as to minimize "hunting" for proper setting. The control valve preferred for intake air restriction is a [throttle body] <u>butterfly</u> valve [for a spark ignition engine]. This embodiment has the capability of being reprogrammed in the field to change the set temperature, or the gain. The linkage between the actuator and the valve is preferably configured so that vibration would not wallow out hard links. When operating without a heat exchanger, only three components are required: the intake valve, the controller, and exhaust temperature measurement. These three components require a minimum of space and are

a8

a8

inexpensive.--